

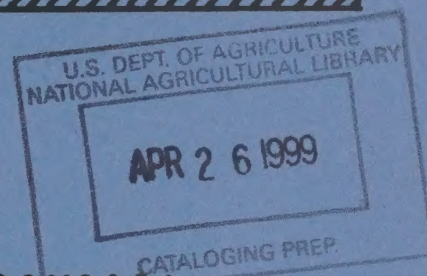
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UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
NORTHEASTERN REGION
BELTSVILLE AGRICULTURAL RESEARCH CENTER

1975



REPORT ON MEAT ANIMAL
AND
RELATED RESEARCH CONDUCTED
AT
BARC



**United States
Department of
Agriculture**



National Agricultural Library

Forward

The United States relies heavily on its ability to produce and export agricultural products in return for natural and manufactured resources from other countries and in turn providing its citizens with one of the world's highest standards of living. Especially in times of shortages of energy and natural resources, with concurrent inflation, there is a need to perform research at BARC which is relevant to the requirements of the meat industry and the public. To optimize research effectiveness of meat animal and related research at BARC, an Ad Hoc Committee was established by the Area Director to: "1) summarize the meat animal research, staff and facilities at the Beltsville Agricultural Research Center and the potential for strengthening that program in high priority research areas at a minimum cost; and 2) explore approaches for improving communication among scientists engaged in meat animal research."

This report deals with both objectives. Objective one (1) is presented in tables which describe: 1) Meat Animal and Related Research Conducted at BARC Identified by WRU; 2) Personnel involved in Meat Animal Research; 3) Meat Animal Research Conducted at BARC Identified by CRIS; 4) Extramural research directed by BARC scientists; 5) Facilities for Meat Animal Research; and 6) Areas for potential strengthening with minimum expenditure. Objective two (2) deals with improved cooperation among meat animal scientists at BARC and is presented in sections which

describe: 1) "Rap" sessions with the Area Director; 2) A work planning conference; 3) Availability of livestock; 4) Joint use equipment; 5) New CRIS review procedures; and 6) Meetings to develop position statements.

Respectfully submitted:

March 14, 1975

Dr. L. A. Johnson
Dr. A. W. Kotula, Co-Chairman
Dr. R. W. Miller
Dr. K. Ono, Co-Chairman
Dr. T. S. Rumsey
Dr. F. G. Tromba

L. A. Johnson
A. W. Kotula
R. W. Miller
K. Ono
T. S. Rumsey
F. G. Tromba

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Objective 1

This section deals with objective one (1): "summarize the meat animal research staff and facilities at the Beltsville Agricultural Research Center and the potential for strengthening that program in high priority research areas at a minimum cost." The presentation is mainly in table form which describes: 1) Meat Animal and Related Research Conducted at BARC Identified by WRU; 2) Personnel involved in Meat Animal Research; 3) Meat Animal Research Conducted at BARC Identified by CRIS; 4) Extramural Research Directed by BARC Scientists; 5) Facilities for Meat Animal Research; and 6) Areas for Potential Strengthening with Minimum Expenditure.

Research Effort by WRU:

Scientists at the Beltsville Agricultural Research Center have been involved in animal research for over forty years. Through this research, major contributions have been made in the areas of breeding,

physiology, parasitology, nutrition, marketing and environmental quality, so that the Beltsville Agricultural Research Center has international prominence as a center of excellence for research on meat animals. Since 1972, the research areas describing meat animal and related research have been categorized under broad research programs identified as Work Reporting Units. Tables 1a - 1f present the research effort currently being expended in scientific man years (SMY) and dollars, for each research area. The tables are organized on the basis of a laboratory being the smallest budgeted research unit with Institutes consisting of a grouping of related laboratories. At present, six Institutes have researchers involved in meat animal and related research. Other research areas such as forage production and control of forage insects are relevant to meat animal research but are not included here because their major contributions from such programs are not directly concerned with meat animal research.

	<u>SMY</u>	<u>Dollars</u>
Nutrition Institute	22	1,668,000
Animal Parasitology Institute	20.6	1,174,200
Agricultural Marketing Research Institute	18.6	650,850
Animal Physiology and Genetics Institute	13.6	1,097,500
Agricultural Environmental Quality Institute	4.3	268,600
Insect Identification and Beneficial Insect Introduction Institute	0.3	10,000

The research role of each of these Institutes is described in the "Organization and Program" of the Beltsville Agricultural Research Center.

Scientific Personnel:

The laboratories of these Institutes are staffed with scientists having a diversity of disciplines for focusing on integrated problems involving aspects of production, marketing and environmental quality. Tables 2a - 2f present, by Institute and Laboratory, the scientist and professional title. The tables include only those scientists actually involved in meat animal and related research, the exception being the Chairmen of the Institutes are also designated even when they are not directly involved in such research.

Research Effort by CRIS:

Tables 3a - 3f present the BARC research effort on meat animal and related research, by SMY and dollar for each intramural CRIS project. These 74 relatively specific projects represent the total complex intramural research effort of BARC which is related to meat animals. Support at the level of approximately 74.8 SMY and a total of \$4,869,100 results in some CRIS projects receiving only fractional SMY input. Thirty-two of the projects have 0.4 SMY or less input. Since live animal research is so costly, economies are often made by extensive use of test animals in an integrated approach to achieve research objectives.

Extramural:

When economically feasible, the research program at BARC has been supplemented by cooperative research with state experiment stations, other government agencies, industry and foreign research institutions. Tables 4a - 4f present the current involvement of BARC scientists in extramural meat animal and related research. With the decreased availability of funds for extramural research, the PL 480 research grant has taken on greater importance as a means of expanding research efforts. Whereas previously scientists involved in this grant program, which is administered by the International Programs Division, acted in an advisory capacity to review projects and progress reports, some are now participating to a much greater degree in formulating plans, modifying procedures, interpreting results and are even becoming co-authors on resultant manuscripts.

Facilities and Services:

Services and facilities at BARC have expanded research capabilities and have aided the scientists in carrying out thorough in-depth studies that would be difficult at other locations in the country. All of the Institutes benefit by the close proximity of the National Agricultural Library. Complementing the standard services offered by a major library, the NAL offers computerized information retrieval services using the Cataloging Index on Line (CAINOL) and Medline Terminals. Results are obtained in terms of minutes or hours instead of days or weeks.

In addition to cooperative work with other laboratories at BARC, scientists have numerous contacts with colleagues at the National Institutes of Health, Armed Forces Institute of Pathology, Walter Reed Army Institute of Research, Food and Drug Administration and local universities. Such contacts range from informal exchanges to cooperative projects and co-authored publications. The University of Maryland and other universities are located a short distance away so professional relationships and cooperative agreements are readily developed. Also, undergraduate and graduate students are relevantly employed at BARC. The National Institute of Health is nearby and is consulted, most often, on a person to person level. Many BARC scientists attend NIH seminars and attend the graduate and undergraduate evening classes sponsored by the Foundation for Advanced Education in the Sciences, Inc. The Food and Drug Administration, with the cooperation of BARC scientists, conducts research on the Center. The proximity of the downtown FDA laboratory personnel encourages mutual planning of research. For example, members from FDA, APHIS, National Program Staff, Eastern Regional Research Center and BARC were able to meet conveniently at FDA, downtown, to discuss the direction for research on evaluating chlorine residue on meat. The USDA Graduate School provides an opportunity for up-dating one's professional competence. Selected Graduate School courses in science are available at BARC and downtown.

BARC is uniquely located to take advantage of involvement with other USDA services located in the District of Columbia. Close association with the Cooperative State Research Service has resulted in a national participation by BARC laboratory scientists in Regional Technical Committees to improve cooperation with state experiment stations. Meat Grading and Standardization Branches of the Livestock Division, Agricultural Marketing Service, have shared research problems needing attention. Research has in many instances been jointly planned, executed and published.

Due to the heavy concentration of research institutions in the neighborhood, most of the scientific equipment and supply houses have service and distribution outlets in the Washington Metropolitan area. This minimizes down time on equipment and personnel. Contract laboratories for analyses are readily available.

BARC is uniquely situated and equipped with respect to facilities and personnel to conduct market-related research on livestock and meat. Proximity to and cooperation with the commercial meat firms have aided research conducted by BARC scientists. Slaughter, breaking and further processing establishments are available within a 25-mile radius for cooperative research under commercial conditions. Safeway, Grand Union and Giant meat distribution centers at Landover, Maryland, have continued interest in cooperative research dealing with evaluation of shipping and handling methods, microbiological decontamination and fat analysis of ground beef. In addition, an Abattoir and two skilled

meat cutters are available at BARC for routine or special fabrication of carcasses and meat resulting from production and marketing research. A staff veterinarian is available for ensuring the wholesomeness of all meat animals and resultant carcasses.

A support staff for administration, farm management and technical and non-technical support are available at BARC to aid in the research effort on meat animal and related research. Within Institutes, many of the laboratories can identify facilities and equipment which are integrated into a unique capability for segments of animal research.

Facilities for meat animal research within the Nutrition Institute are adequate for the 22 scientists and support staff with space for some expansion. Current facilities include large and small animal quarters, feed mixing facilities and well-equipped microbiology, nutrition and analytical laboratories for conducting both applied and fundamental research. The 21 scientists in the Non-ruminant, Ruminant and Microbiology Laboratories are housed in the same building; this convenience is a major factor in fostering team effort in nutritional research. In addition to the equipment usually found in or available to other research laboratories, specific equipment available in the Nutrition Institute laboratories includes environmental and calorimetric chambers for poultry; continuous culture artificial rumen equipment in close proximity to N^{15} - mass spectroscopy equipment; large animal calorimetry chambers with automatic data logging equipment; N^{15} - mass spectrograph in combination with automated amino acid analyzing equipment; and, experimental silo equipment and facilities for conducting forage preservation research. In general, the laboratories are

equipped with modern gas chromatography, liquid chromatography, atomic absorption, isotope and autoanalyzer equipment which increases the versatility of the laboratories for conducting fundamental nutrition research and responding to high priority areas of research that have a critical void of information.

One of the major sites of meat animal research at BARC is the Animal Parasitology Institute. This Institute is most favorably situated in terms of the physical attributes of its location, the nature of its laboratories and animal quarters, the availability of quality animals for research and its proximity to other organizations engaged in similar research. Located on approximately 400 acres, the Institute is isolated from all other research units at BARC, thus facilitating a rigid program of agent safety. The research laboratories are housed primarily in six buildings. With few exceptions, these have all been renovated recently providing scientists with modern, well-equipped facilities. Fixed installations include two electron microscopes, low temperature laboratories, walk-in environmental chambers and large capacity low-temperature storage rooms. Animal quarters either have been newly constructed or recently renovated. With few exceptions (e.g. field shelters), the animal quarters are of concrete block. Most are provided with hot water for cleaning, heat and forced air ventilation. A recently completed postmortem-incinerator facility features well-appointed quarters for complete necropsies and gross and microscopic histology. Facilities are also provided for larval cultivation and recovery, for serum and tissue processing under

aseptic conditions, and for animal surgery. The incinerator is rated for pathological wastes with a capacity of 1000 lb/hr. The Institute maintains closed herds of cattle, swine and sheep which supply most of the research needs for large animals. These herds have been established for many years and are carefully guarded to minimize problems with extraneous infections. Scientists are annually provided with some 25 calves, 175 pigs and 200 lambs, all certified free from specific pathogens which could compromise or invalidate research results.

Facilities for the meat animal and related research within the Agricultural Marketing Research Institute are being renovated and include a kitchen with appropriate taste panel facilities, freezer and cooler rooms for meat storage and evaluation, and a mobile microbiological laboratory which is used to carry out research in commercial meat packing plants and distribution centers. Facilities for rearing small animals and for animal surgery are available for use from other Institutes. Expansion of research capabilities for evaluating shelf life and meat quality by renovating an unused portion of the Abattoir is a distinct possibility.

The research laboratories of the Animal Physiology and Genetics Institute are generally modern and well-equipped with extensive renovation of several laboratories currently in progress. The Institute has an electron microscope unit as well as extensive expertise in hormone immunoassay procedures. Extensive holding facilities are available for swine, sheep and poultry. Increased research capability

is anticipated once the holding facilities, including those for cattle have been renovated. Nearly one-half of the research of the Institute is devoted to milk and egg production and provides facilities and equipment that are thus available to supplement resources for meat animal research.

The Agricultural Environmental Quality Institute is equipped with one of the few dehydrators for drying animal waste that are available in the country. The dehydrator is a great asset for animal waste recycling research. The Institute also possesses open-top field chambers to assess the input of air pollution on yield and quality of forage crops. Two high resolution mass spectrophotometers contribute to the success in organic chemical synthesis and analytical chemistry research.

Potential for Strengthening Program in High Priority Research Areas:

Although this section on potential lists many priority research areas that should be strengthened, the Committee feels that individual scientists and laboratory chiefs are endeavoring to obtain support for their particular high priority research through normal administrative channels. Therefore the committee recommends two alternative methods for strengthening high priority research areas. One is through improved communication and cooperation of scientists for the better utilization of present facilities and funding at BARC. The second involves documentation of a position statement based on the best judgment of meat animal scientists representing a broad spectrum of potential cooperators, who have a mutual desire to research and solve a particular high priority problem. The integrated problem package would be forwarded for funding consideration. Both of these approaches are discussed in part 2 of this report.

A. Increase Efficiency of Meat Production

Three major areas of concern when considering research on increasing the efficiency of meat production are: reproductive efficiency, feed utilization and disease control. Within these general areas, there is potential for strengthening current programs through increased cooperation among scientists. Several potential efforts are currently being discussed for possible inclusion into the existing Beltsville program.

In the area of reproduction, there is potential for:

- 1) Improving the coordination of genetic experiments with animal nutrition and meat quality research on swine.
- 2) Investigating the use of competitive fertilization trials in combination with genetic experiments on swine and possibly cattle and increase cooperation with the insect chemosterilant program to test different sterilants on mammalian fertilization.
- 3) Increasing the utilization of existing Beltsville dairy herd for more intensive reproduction studies.

Improving feed utilization includes research in rumen microbiology, ruminant nutrition and swine and turkey nutrition. In this area there is potential for:

- 1) The application of knowledge on the nutrient requirements of rumen bacteria in formulating diets to improve nutrient utilization by ruminants.
- 2) Developing the use of N^{15} in fundamental rumen microbial studies designed to investigate nitrogen metabolism in the rumen.
- 3) Increasing efforts on the utilization of forages by ruminants through fundamental studies on the biochemistry of complex carbohydrates and by investigating methods of processing or preserving current high quality forages that will improve nutrient utilization.

- 4) Increase the amount of information obtained from nutrition trials by developing cooperative efforts with the meat quality research program.
- 5) Expand efforts in studies on the fundamental aspects of fetal pig nutrition.

The control of disease is important in maximizing the productivity of meat animals. In this area there is potential for:

- 1) Cooperation with the Nutrition Institute in evaluating the effects of management practices on the epidemiology of parasitic diseases and the relationships between nutrition and parasitism.
- 2) Cooperation with the Plant Protection Institute on the use of host-parasite systems or parasite cultures as models for investigating the biological activity of insect attractants and hormones.
- 3) Cooperation with the Insect Identification and Beneficial Insect Introduction Institute in identification and selection of predatory insects for control of parasites in their free-living stages or in intermediate hosts.
- 4) Cooperation with APHIS and state experiment stations to implement a trace-back program for discovering foci of parasitic diseases, particularly those of medical importance.

B. Protect the Quality of the Environment:

The scientific effort in protecting the quality of the environment as related to meat animal research can be, at the present time, classified into four general areas:

- 1) Disposal of livestock wastes and whey by feeding these products to animals.
- 2) Effect and metabolism of pesticides, agricultural chemicals and environmental and industrial pollutants on farm animals.
- 3) Control of insect pests (flies) on meat animals without the use of insecticides.
- 4) Effect of air pollution on forage yield and quality.

One of the major expenses in conducting meat animal research is the cost of feeding and caring for the animals. At the present time there is production research being conducted with the major classes of meat animals. Thus, one way to strengthen the area of environmental protection is to have further cooperation between scientists engaged in production research and those involved in research on protecting the environment. In this way, animals and facilities could be shared, therefore, maximizing their utilization.

A specific example might include the advice of a scientist engaged in waste disposal research when new meat animal facilities are being planned. Also, animal feeding trials could be conducted on forages exposed to environmental pollution and those protected from pollution.

In turn, scientific expertise and equipment in the Agricultural Environmental Quality Institute could be made available to scientists engaged in more basic feed utilization and reproduction studies.

C. Improving Consumer Acceptability:

Public health and economics are two general areas of research which require high priority effort. Specifically, high consumption of meat has been implicated, justifiably or not, in increasing the incidence of cardiovascular diseases and some forms of cancer. "Prudent diet" is being recommended by many people until definitive causal relationships can be established. Formulation of a "prudent diet" requires reliable knowledge of the nutritional contents of meat. The Agricultural Marketing Research Institute is studying the feasibility of evaluating the nutritional contents of several grades of meat, using existing personnel. Consultation with members of the Nutrition Institute and Food Economic Institute have been initiated. This type of research will provide valuable data for the grading service of AMS and the consumer who are demanding better nutritional identification of meat, and FEI for revising Handbook 8. The Agricultural Marketing Institute will intensify research effort in the area of application of optical techniques for evaluating meat quality. Present results indicate that such techniques can be applied successfully to evaluate fat content in ground beef and possibly segregate bacon on the basis of lean content.

In the area of economics, the need to reduce the price of retail meat is critical. On-going projects which are relevant and need further development deal with time-motion studies and handling efficiency during distribution of meat in wholesale and retail outlets. Such

studies will compare the benefits of handling boxed beef versus carcass beef and, in order to extend shelf life of meat, evaluate alternative methods of displaying meat products in retail stores. Increased efficiency of meat handling will result from these studies. Development of technology for safe transport and handling of diseased animals to meat packing plants requires attention. Modification of conventional open-type livestock trailer vans is needed to prevent spreading of epidemic as livestock vehicles travel through animal producing areas.

TABLE 1a
INTRAMURAL MEAT ANIMAL AND RELATED RESEARCH AT BARC IDENTIFIED BY WRU
NUTRITION INSTITUTE

Laboratory	WRU No.	Research Activity	SMY ^a	Dollars
Dairy Foods Nutrition	1107-14870 ^b	Whey disposal by utilization	1.0	70,000
Non-Ruminant Nutrition	1107-14302	Antibiotic - farm animal feeding	0.4	35,100
	1107-15530	Feed efficiency - swine	4.6	143,500
	1107-16112	Poultry reproduction efficiency ^c	2.0	212,200
Nutritional Microbiology	1107-14301	Antibiotic - farm animal feeding	0.4	43,000
	1107-15512	Feed efficiency - beef	1.6	100,500
	1107-14910	Feed - field crop residues	2.0	99,800
Ruminant Nutrition	1107-11530	Beef - consumer production practices	0.4	25,900
	1107-14280	Chemical residues - livestock and poultry	1.3	127,200
	1107-15511	Feed efficiency - beef	2.9	281,700
	1107-15520	Feed efficiency - dairy	3.8	313,000
	1107-16151	Sheep reproduction efficiency	<u>1.6</u>	<u>143,100</u>
		Total	22.0	\$1,668,000

^aFraction of an SMY indicates a scientist is directing only part of his time toward meat animal research in a given research activity.

^bWRU number.

^cLack of facilities prevents additional SMY input into this area at the present time.

TABLE 1 b
INTRAMURAL MEAT ANIMAL AND RELATED RESEARCH AT BARC IDENTIFIED BY WRU
ANIMAL PARASITOLOGY INSTITUTE

Laboratory	WRU No.	Research Activity	SMY	Dollars
Office of the Chairman	1105-12040	Broadly based research, animal & veterinary sciences	1.0	181,400
Haemoprotozoan Diseases	1105-11940	Control of anaplasmosis	1.5	100,000
Histoprotozoan Diseases	1105-11910	Coccidiosis -- cattle and sheep	2.1	74,000
	1105-11930	Control - Poultry diseases	5.9	296,800
Non-Ruminant Helminthic Diseases	1105-11920	Control - Swine internal worms	2.9	137,300
	1105-14320	Control of trichinosis	2.1	128,000
Ruminant Helminthic Diseases	1105-11190	Sheep-prevention and control roundworms, etc.	3.3	147,700
	1105-11900	Stomach and intestinal nematodes - cattle	1.8	104,000
Total			20.6	\$1,174,200

TABLE 1c

INTRAMURAL MEAT ANIMAL AND RELATED RESEARCH AT BARC IDENTIFIED BY WRU
AGRICULTURAL MARKETING RESEARCH INSTITUTE

Laboratory	WRU No.	Research Activity	SMY	Dollars
Animal Products Marketing	1104-15862	Food marketing and distribution	4.0	129,000
Food Distribution Research	1104-15863	Food marketing and distribution	0.2	6,000
Instrumentation Research	1104-13732	Fruits and vegetables market quality	0.5	30,000
Transportation and Packaging Research	1104-15841	Packaging and transportation - agricultural commodities	2.0	94,500
Market Operations Laboratory	1104-15864	Food marketing and distribution	3.8	110,600
Meat Science Research	1104-14320	Control of trichinosis	0.2	5,900
	1104-15790	Technologies - Processing Poultry	0.2	9,000
	1104-15810	Marketing - Animal Products	0.5	24,400
	1104-15851	Grading animal products	6.2	204,000
	1104-15981	Salmonella - agricultural products	0.9	37,400
		Total	18.6	650,850

TABLE 1 d

INTRAMURAL MEAT ANIMAL AND RELATED RESEARCH AT BARC IDENTIFIED BY WRU
ANIMAL PHYSIOLOGY & GENETICS INSTITUTE

Laboratory	WRU No.	Research Activity	SMY	Dollars
Avian Physiology	1106-16112	Improve reproductive efficiency of poultry	3.0	234,475
Animal Improvement Programs Laboratory	1106-15980	Poultry and poultry products (control of certain hatchery disseminated diseases, i.e. salmonella and mycoplasma)	1.4	53,917
Biochemistry	1106-11571	Milk consumer production practices (control of fat composition of milk and meat)	0.6	45,500
	1106-11210	Protect farm animals from toxic and residual effects of pesticides and other agricultural chemicals (Biological effects of PCB)	0.4	9,700
Genetics & Management	1106-11572	Milk consumer production practices	0.2	37,400
	1106-11540	Pork consumer - fat/lean ratio	1.0	134,400
Reproduction Laboratory	1106-16131	Improve reproductive efficiency in dairy cattle	4.0	330,000
	1106-16140	Improve swine reproductive efficiency	<u>3.0</u>	<u>252,133</u>
		Total	13.6	1,097,525

TABLE 1e

INTRAMURAL MEAT ANIMAL AND RELATED RESEARCH AT BARC IDENTIFIED BY WRU
AGRICULTURAL ENVIRONMENTAL QUALITY INSTITUTE

Laboratory	WRU No.	Research Activity	SMY	Dollars
Air Pollution Laboratory	1103-14780	Plant protection - air pollutants	0.5	23,700
Analytical Chemistry Laboratory	1103-14390	Insect control chemical formulations	0.1	4,350
Biological Evaluation of Chemicals Laboratory	1103-14411	Insects affecting man	0.1	6,070
Biological Waste Management Laboratory	1103-14740	Animal waste management	1.7	125,580
Biologically Active Natural Products Laboratory	1103-12153	Physiology & reproduction of insects	0.4	13,790
Chemical and Bio-physical Control Laboratory	1103-14282	Pesticide residue - livestock & poultry	0.5	24,100
	1103-15490	Pests of livestock & poultry	0.2	6,750
Insect Chemosterilants Laboratory	1103-12152	Physiology & reproduction of insects	0.1	3,440
Organic Chemical Synthesis Laboratory	1103-15572	Insect behavior & attractants	0.2	8,200

Pesticide Degradation Laboratory	1103-11210	Protect animals - toxic chemicals	0.2	16,690
	1103-14283	Pesticide residue - livestock & poultry	0.1	5,600
Physical Control Laboratory	1103-12010	Improve cattle & swine production	0.2	9,500
	1103-14281	Pesticide residue - livestock & poultry	0.2	6,720
	1103-15470	Hay Equipment - harvesting - processing - storing	<u>0.3</u>	<u>14,100</u>
		Total	4.3	\$268,590

TABLE 1 f
INTRAMURAL MEAT ANIMAL AND RELATED RESEARCH AT BARC IDENTIFIED BY WRU
INSECT IDENTIFICATION & BENEFICIAL INSECT INTRODUCTION INSTITUTE

Laboratory	WRU No.	Research Activity	SMY	Dollars
Systematic Entomology	1111-12120	Identification & classification. Insects of Agricultural importance	0.3	10,000

TABLE 2a

SCIENTISTS CONDUCTING MEAT ANIMAL AND RELATED RESEARCH AT BARC
NUTRITION INSTITUTE

Institute Chairman: W. Mertz 34-42157

Laboratory	Scientist	Title	Phone
Dairy Foods Nutrition	R. E. Hargrove	Microbiologist	34-42311
Non-Ruminant Nutrition	L. T. Frobish, Chief	Animal Scientist(Nutr.)	34-42222
	R. J. Davey	Animal Scientist(Nutr.)	34-42359
	R. J. Lillie	Animal Scientist(Nutr.)	34-42112
	H. Menge	Animal Scientist(Nutr.)	34-42112
	H. Ota	Agricultural Engineer	34-42359
	E. J. Robel	Chemist	34-42112
	N. Steele	Animal Scientist(Nutr.)	34-42222
Nutritional Microbiology	L. L. Slyter, Chief	Chemist	34-43431
	J. Gutierrez	Microbiologist	34-43432
	P. B. Marsh	Plant Physiologist	34-43432
	M. E. Simpson	Plant Pathologist	34-43432
Ruminant Nutrition	R. R. Oltjen, Chief	Animal Scientist(Nutr.)	34-42283
	J. Bond	Animal Scientist(Nutr.)	34-42283
	D. A. Dinius	Animal Scientist(Nutr.)	34-42283
	H. K. Goering	Animal Scientist(Nutr.)	34-42100
	I. L. Lindahl	Chemist	34-42283
	G. P. Lynch	Animal Scientist(Physiol.)	34-42100
	P. W. Moe	Animal Scientist(Nutr.)	34-42409
	P. J. Reynolds	Animal Scientist(Nutr.)	34-42100
	T. S. Rumsey	Animal Scientist(Physiol.)	34-42284
	H. F. Tyrrell	Animal Scientist(Nutr.)	34-42409
	D. R. Waldo	Animal Scientist(Nutr.)	34-42101

TABLE 2b

SCIENTISTS CONDUCTING MEAT ANIMAL AND RELATED RESEARCH AT BARC
ANIMAL PARASITOLOGY INSTITUTE

F. D. Enzie, Chairman: 34-42201

Laboratory	Scientist	Title	Phone
Office of the Chairman	J. R. Lichtenfels	Zoologist	34-42444
Haemoprotozoan Diseases	T. O. Roby, Chief	Vet. Med. Officer	34-42427
	T. E. Amerault	Microbiologist	34-42427
	J. E. Rose	Chemist	34-42427
Histoprotozoan Diseases	D. J. Doran, Chief	Supvry. Zoologist	34-42300
	A. Chute	Zoologist	34-42509
	R. Fayer	Zoologist	34-42509
	R. G. Leek	Zoologist	34-42509
	E. E. Lundberg	Zoologist	34-42509
	P. A. Madden	Microbiologist	34-42193
	D. K. McLoughlin	Zoologist	34-42300
	J. M. Vetterling	Zoologist	34-42193
Non-Ruminant Helminthic Diseases	F. G. Tromba, Chief	Supvry. Zoologist	34-42406
	W. R. Anderson	Microbiologist	34-42406
	J. S. Andrews	Zoologist	34-42406
	R. S. Isenstein	Zoologist	34-42406
	R. D. Romanowski	Chemist	34-42406
Ruminant Helminthic Diseases	H. Herlich, Chief	Supvry. Zoologist	34-42195
	M. L. Colglazier	Zoologist	34-42195
	F. W. Douvres	Zoologist	34-42195
	F. D. Enzie	Agr. Administrator	34-42201
	K. C. Kates	Zoologist	34-42195
	R. A. Knight	Zoologist	34-42195
	F. Stringfellow	Zoologist	34-42195

TABLE 2c

SCIENTISTS CONDUCTING MEAT ANIMAL AND RELATED RESEARCH AT BARC
AGRICULTURAL MARKETING RESEARCH INSTITUTE

Institute Chairman: Essex E. Finney, Jr.
34-43338

Laboratory	Scientist	Title	Phone
Animal Products Marketing Laboratory	T. F. Webb, Chief	Agric. Economist	34-42800
	H. R. Smalley	Agric. Mktg Spec.	34-42400
	J. W. Goble	Ag. Marketing Spec.	34-42803
	C. E. Harris	Ag. Marketing Spec.	34-42800
	W. A. Moats	Research Biochemist	34-42224
Food Distribution Research Laboratory	H. S. Ricker	Ag. Marketing Spec.	34-42805
	J. L. Runyan	Ag. Marketing Spec.	34-42805
Instrumentation Research Laboratory	K. H. Norris, Chief	Res. Ag. Engineer	34-43650
	D. R. Massie	Res. Ag. Engineer	34-43650
Transportation and Packaging Research Lab	B. H. Ashby	Ag. Marketing Spec.	34-42821
	K. E. Hoke	Ag. Marketing Spec.	34-42815
Market Operations Research Laboratory	J. P. Anthony	Ind. Economist	34-42810
	C. L. Goulston	Ind. Engineer	34-42810
	M. D. Volz	Ind. Engineer	34-42810
Meat Science Research Laboratory	A. W. Kotula, Chief	Res. Food Tech.	34-43525
	T. G. Althen	Animal Physiol.	34-42401
	H. R. Cross	Res. Food Tech.	34-42401
	P. F. Crowe	Research Chemist	34-43536
	B. S. Emswiler	Research Micro.	34-43411
	A. R. Hayden	Research Chemist	34-43526
	K. Ono	Research BioChem.	34-42401
	W. Pollard	Food Tech.-Post doctorate	34-43525
	H. R. Smalley	Agric. Mktg. Spec.	34-42400
	T. F. Webb	Agric. Economist	34-43525

TABLE 2d

SCIENTISTS CONDUCTING MEAT ANIMAL AND RELATED RESEARCH AT BARC
ANIMAL PHYSIOLOGY AND GENETICS INSTITUTE

Institute Chairman: J. W. Smith 34-42259

Laboratory	Scientist	Title	Phone
Animal Improvement Program	F. N. Dickinson, Chief	Super. Res. Animal Sci.	34-42334
	I. L. Peterson	Vet. Med. Officer	34-42227
	R. S. Schar	Ani. Husbandman	34-42227
Avian Physiology	H. Opel	Res. Physiologist	34-42099
	M. Arcos	Res. Biochemist	34-42280
	T. J. Sexton	Res. Physiologist	34-42099
Biochemistry	J. Bitman, Chief	Res. Biochemist	34-42424
	H. C. Cecil	Res. Biologist	34-42026
	T. R. Wrenn	Res. Biologist	34-42235
Genetics & Management	R. H. Miller, Chief	Res. Geneticist	34-42445
	B. Bereskin	Res. Geneticist	34-42260
Reproduction	H. W. Hawk, Chief	Res. Physiologist	34-42550
	D. J. Bolt	Res. Physiologist	34-42018
	H. D. Guthrie	Res. Physiologist	34-42342
	L. A. Johnson	Res. Physiologist	34-42342
	C. A. Kiddy	Res. Ani. Scientist	34-44213
	V. G. Pursel	Res. Physiologist	34-42342
	C. E. Rexroad	Res. Physiologist	34-42446
	W. P. Wergin	Res. Microbiologist	34-42046

TABLE 2 e

SCIENTISTS CONDUCTING MEAT ANIMAL AND RELATED RESEARCH AT BARC
AGRICULTURAL ENVIRONMENTAL QUALITY INSTITUTE

Institute Chairman: L. L. Danielson 34-43030

Laboratory	Scientist	Title	Phone
Air Pollution Laboratory	R. K. Howell	Res. Plant Pathologist	34-42133
Analytical Chemistry Laboratory	C. Corley	Res. Chemist	34-42472
Biological Evaluation of Chemicals Laboratory	O. F. Bodenstein	Res. Entomologist	34-42275
Biological Waste Management Labora- tory	C. C. Calvert	Res. Animal Scientist	34-43933
	L. W. Smith	Res. Animal Scientist	34-43933
Biologically Active Natural Products Laboratory	M. Schwarz	Res. Chemist	34-42019
Chemical and Biophysical Control Laboratory	R. W. Miller	Res. Animal Scientist	34-42478
	N. O. Morgan	Res. Entomologist	34-42478
	L. G. Pickens	Res. Entomologist	34-42478
Insect Chemosterilants Laboratory	A. B. Borkovec	Res. Chemist	34-42136
Organic Chemical Synthesis Laboratory	P. E. Sonnet	Res. Chemist	34-42138
Pesticide Degradation Laboratory	G. F. Fries	Res. Animal Scientist	34-43082
Physical Control Laboratory	R. F. Dudley	Res. Agricultural Engineer	34-42237
	E. E. Jones	Res. Agricultural Engineer	34-42237
	H. J. Retzer	Res. Agricultural Engineer	34-42272

TABLE 2 f

SCIENTISTS CONDUCTING MEAT ANIMAL AND RELATED RESEARCH AT BARC
INSECT IDENTIFICATION AND BENEFICIAL INSECT
INTRODUCTION INSTITUTE

Institute Chairman: L. V. Knutson
34-43182

Laboratory	Scientist	Title	Phone
Systematic Entomology	W. W. Wirth	Entomologist	44-75347

TABLE 3a

MEAT ANIMAL AND RELATED RESEARCH CONDUCTED AT BARC IDENTIFIED BY CRIS
NUTRITION INSTITUTE

Research Activity	CRIS Project	Scientist	SMY	Dollars
Whey disposal by utilization	1107-14870-002 Nutritional and other uses for the permeate from the ultrafiltration of whey	R. E. Hargrove (Dairy Food Ntr. Lab.) G. P. Lynch (Rum. Nutr. Lab.)	1.0	74,000
Antibiotic - farm animal feeding	^a 1107-14302-001 The absorption, excretion and biological effect of tetracyclines in swine	L. T. Frobish R. J. Davey (Non-Rum. Nutr. Lab.)	0.4	35,100
Feed efficiency - swine	1107-15530-002 Utilization of energy by swine	N. Steele R. J. Lilly E. J. Robel L. T. Frobish (Non-Rum. Nutr. Lab.)	3.1	83,700
	1107-15530-001 Nutritional and metabolic responses of swine selected for high and low backfat thickness	L. T. Frobish R. J. Davey N. Steele (Non-Rum. Nutr. Lab.)	1.5	59,800
	1107-16112-001 Turkey environment ^a and nutrition	H. Ota H. Menge E. J. Robel (Non-Rum. Nutr. Lab.)	2.0	212,200

Antibiotic - farm animal feeding	1107-14301-001 ^a	Antibiotic resistance in intestinal bacteria of farm animals	L. L. Slyter (Nutr. Micro. Lab.)	0.4	43,000
Feed efficiency - beef	1107-15512-001	Intestinal micro-organisms and their contribution to animal nutrition	L. L. Slyter (Nutr. Micro. Lab.)	0.6	55,000
	1107-15512-002	Growth factors and their effect on the cultivation of ruminal bacteria and protozoa	J. Gutierrez (Nutr. micro. lab.)	1.0	45,500
Feed-field crop residues	1107-14910-001	Degradation and utilization of cotton-gin waste products by farm animals	P. B. Marsh M. E. Simpson (Nutr. Micro. Lab.)	2.0	99,800
Beef-consumer production practices	1107-11530-001 ^b	Approaches to altering the depot fat of ruminants	D. A. Dinis R. R. Oltjen T. S. Rumsey	0.4	26,100
Chemical residues - livestock and poultry	1107-14280-001	Metabolism of agricultural chemicals in beef cattle	T. S. Rumsey (Rum. Nutr. Lab.)	0.9	90,860
	1107-14280-002	Effects of toxic trace elements in livestock and livestock products	R. J. Reynolds (Rum. Nutr. Lab.)	0.4	40,640
Feed efficiency - beef	1107-15511-003	Utilization of plant and animal waste products and of forage by beef cattle	D. A. Dinis R. R. Oltjen (Rum. Nutr. Lab.)	0.8	103,400
	1107-15511-002	Protein and non-protein utilization by ruminants	R. R. Oltjen D. A. Dinis (Rum. Nutr. Lab.)	0.9	121,073

Feed efficiency - dairy	1107-15511-001	Nutritional and physiological development of the growing calf	J. Bond G. P. Lynch (Rum. Nutr. Lab.)	1.2	70,800
	1107-15520-002	Influence of heat and other processing variables on the utilization of forage nitrogen	H. K. Goering (Rum. Nutr. Lab.)	1.0	69,000
	1107-15520-001	Formaldehyde and other additives for ensiling forage	D. R. Waldo (Rum. Nutr. Lab.)	0.8	92,000
	1107-15520-003	Ruminant digestion of energy and protein	D. R. Waldo G. P. Lynch (Rum. Nutr. Lab.)	1.0	46,000
Sheep reproduction efficiency	1107-15520-004	Utilization of digestible energy in cattle	H. F. Tyrrell P. W. Moe (Rum. Nutr. Lab.)	1.0	106,000
	1107-16151-001	Rearing newborn lambs	I. L. Lindahl (Rum. Nutr. Lab.)	0.2	21,000
	1107-16151-002	Improvement of rate of reproduction through use of the Finnsheep	I. L. Lindahl (Rum. Nutr. Lab.)	0.1	15,000
	1107-16151-003	Influence of management practices on internal parasitism of lambs	I. L. Lindahl (Rum. Nutr. Lab.)	0.1	1,500
	1107-16151-004	Nutritional requirements of pregnant and lactating ewes and their lambs	P. J. Reynolds I. L. Lindahl (Rum. Nutr. Lab.)	0.7	52,500

1107-16151-005	Development of a strain of sheep capable of reproducing more than once and any time of the year	I. L. Lindahl (Rum. Nutr. Lab.)	0.2	30,000
1107-16151-006	Pregnancy diagnosis in sheep and goats	I. L. Lindahl (Rum. Nutr. Lab.)	0.3	30,000

^a Lack of facilities prevents additional SMY input into this area at the present time.

^b Project Number.

^c In many cases these are rough estimates for a given project and may not reflect the exact spread of a scientist time at present.

^d Project Number.

TABLE 3 b

MEAT ANIMAL AND RELATED RESEARCH CONDUCTED AT BARC IDENTIFIED BY CRIS
ANIMAL PARASITOLOGY INSTITUTE

Research Activity	CRIS Project	Scientist	SMY	Dollars
Broadly based research, Animal & Veterinary Sciences	1105-12040-002 Maintenance-Index Catalogue	J. R. Lichtenfels (Office of the Chairman)	0.6	108,000
	1105-12040-003 Maintenance-Parasite Collection	J. R. Lichtenfels	0.1	18,000
	1105-12040-004 Parasite Identification	J. R. Lichtenfels	0.3	55,400
Control of Anaplasmosis	1105-11940-002 Anaplasmosis of Cattle	T. O. Roby T. E. Amerault J. E. Rose (Haemoprot. Diseases Lab.)	1.5	100,000
	1105-11910-002 Control Coccidiosis-Cattle & Sheep	R. Fayer R. G. Leek D. J. Doran (Histoprot. Diseases Lab.)	2.1	74,000
Control - Poultry Diseases	1105-11930-001 Protozoan Parasites of Poultry Digestive Systems	E. E. Lund A. Chute (Hist. prot. Disease Lab.)	2.0	74,000
	1105-11930-002 Intracellular Parasites of Poultry	D. J. Doran P. A. Madden J. M. Vetterling (Histo. prot. Disease Lab.)	2.9	148,400

1105-11930-003	Treatments for Protozoan Parasites of Domestic Animals	D. K. McLoughlin (Histo. Prot. Disease Lab.)	1.0	74,200
Control - Swine Internal Worms				
1105-11920-001	Biological Control of Parasitic Diseases of Animals	F. G. Tromba W. H. Anderson R. D. Romanowski (Non-Rum. Helm. Diseases Lab.)	2.9	137,300
Control of Trichinosis				
1105-14320-001	Improve Methods for Detection and Control of Trichinosis	J. S. Andrews R. S. Isentein F. G. Tromba (Non-Rum. Helm. Diseases Lab.)	2.1	128,000
Sheep-Prevention & Control Roundworms, etc.				
1105-11190-001	Gastrointestinal nematodes of sheep and measures for their control	R. A. Knight (Rum. Helm. Diseases Lab.)	1.0	53,400
1105-11190-002	Evaluate New & Improved Anthelmintics	K. C. Kates M. L. Colglazier F. D. Enzie (Rum. Helm. Diseases Lab.)	2.3	99,300
Stomach and Intestinal Nematodes - Cattle				
1105-11900-001	Pathogenesis of Gastrointestinal Nematodiasis in Cattle	H. Herlich F. W. Douvres F. Stringfellow (Rum. Helm. Diseases Lab.)	1.8	104,000

TABLE 3 c

MEAT ANIMAL AND RELATED RESEARCH CONDUCTED AT BARC IDENTIFIED BY CRIS
AGRICULTURAL MARKETING RESEARCH INSTITUTE

Research Activity	CRIS Project	Scientist	SMY	Dollars
Food Marketing and Distribution	1104-15862-003 Plan and promote improved poultry and egg marketing facilities	C. E. Harris	2.0	75,000
		J. W. Goble (Dairy & Poultry Prod. Marketing Lab)		
Fruits and Vegetables Market	IRL-6 Development of instruments to measure the quality of agricultural commodities	K. H. Norris	0.5	30,000
		D. R. Massie (Instrumentation Lab)		
Packaging and Transportation - Agricultural Commodities	1104-15841-008 Improving rail-road refrigerated transportation of fresh meats	K. E. Hoke (Trans. & Pack. Res. Lab)	0.3	9,000
		B. H. Ashby K. E. Hoke (Trans. & Pack. Res. Lab)		
	1104-15841-007 Effects of packaging on weight loss to frozen pork during transport and storage	B. H. Ashby (Trans. & Pack. Res. Lab)	0.3	9,000
		B. H. Ashby (Trans. & Pack. Res. Lab)		
Food Marketing and Distribution	1104-15864-005 System for marketing beef from slaughterhouse to retail store	C. L. Goulston (Market Oper. Res. Lab)	1.0	35,000
	1104-15864-007 Evaluation of systems and environment for feeder livestock during shipment from producing areas	J. P. Anthony (Market Oper. Res. Lab)	0.2	11,100

Control of Trichinosis	1104-14320-001	Trichinosis as related to market quality of pork	K. Ono (Meat Science Research Laboratory)	0.2	5,900
	TBD	Maintain and improve poultry quality	A. W. Kotula (Meat Science Research Laboratory)	0.2	9,000
Marketing - Animal Products	1104-15810-001	Efficiency of livestock auction market operations in the Appalachian areas	T. F. Webb (Animal Products Mktg. Laboratory)	0.5	19,000
	1104-15810-006	Improvement in marketing of meat through centralized meat packaging	A. W. Kotula B. S. Emswiler (Meat Science Research Laboratory)	0.4	15,700
	1104-15810-003	Improved layouts and operating criteria for meat packers, purveyors and wholesalers	T. F. Webb H. R. Smalley (Animal Products Mktg. Laboratory)	1.5	43,700
Grading Animal Products	1104-15851-004	Undesirable inclusions intrinsic to animal products	W. Pollard (Meat Science Research Laboratory)	1.0	20,000*
	1104-15851-001	Composition quality and wholesomeness of livestock and meat	A. R. Hayden P. F. Crowe A. W. Kotula (Meat Science Research Laboratory)	2.4	92,700
	1104-15851-002	Beef, pork and lamb yield quality grades	H. R. Cross (Meat Science Research Laboratory)	1.0	41,000

1104-15851-006	Postmortem biochemical changes affecting meat quality	K. Ono T. Althen (Meat Science Research Laboratory)	1.8	69,500	
Salmonella Agricultural Products	1104-15981-002	Control and detection of salmonellae and food poisoning microorganisms on meat	B. S. Emswiler A. W. Kotula (Meat Science Research Laboratory)	1.0	37,400

*Reimbursable funds.

TABLE 3 d

MEAT ANIMAL AND RELATED RESEARCH CONDUCTED AT BARC IDENTIFIED BY CRIS
ANIMAL PHYSIOLOGY AND GENETICS INSTITUTE

Research Activity	CRIS Project	Scientist	SMY	Dollars
Improve reproductive efficiency of poultry	1106-16112-001 Preservation of poultry spermatozoa	T. J. Sexton	1.0	93,790
	1106-16112-002 Control of broodiness in poultry	H. Opel M. Arcos	2.0	140,685
	1106-16112-003 Neuroendocrine control of egg production in poultry	H. Opel M. Arcos (Avian Physiol. Lab.)		
Poultry and poultry products	1106-15980-001 Control of hatchery disseminated diseases	I. L. Peterson R. D. Schar F. N. Dickinson (Anim. Improvement Prog. Lab.)	1.4	53,917
Milk consumer production practices	1106-11571-003 Increasing polyunsaturated fats in milks and meat of ruminants	J. Bitman T. R. Wrenn (Biochem. Lab.)	0.6	45,500
Protect farm animals from toxic and residual effects of pesticides and other agricultural chemicals	1106-11571-002 Biochemical and physiological effects of pesticides, agricultural chemicals, environmental and industrial pollutants on farm and lab animals	H. Cecil (Biochem. Lab.)	0.4	9,700

Milk consumer production practices	1106-11572-005 Evaluation of meat and milk producing abilities of Holstein and Simmental X Holstein crossbred cattle	R. H. Miller (Genetics and Manag. Lab.)	0.2	37,400
Pork consumer - fat/lean ratio	1106-11540-001 Quantitative selection for efficient lean growth and sow productivity in separate lines of swine	B. Bereskin (Genetics and Manag. Lab.)	1.0	134,400
	1106-11540-004 Quantitative genetic studies of maternal and related traits in mice with application to swine improvement	B. Bereskin (Genetics and Manag. Lab.)		
Improve reproductive efficiency in dairy cattle	1106-16131-002 Relationship of immunogenetic factors to fertility	C. A. Kiddy	0.5	41,250
	1106-16131-003 Variation in ultrastructure of reproductive tissue during estrous cycle	W. P. Wergin H. W. Hawk	0.7	57,750
	1106-16131-004 Causes of sperm losses in female reproductive tract	H. W. Hawk C. E. Rexroad	1.6	132,000
	1106-16131-006 Hormonal interrelationships	D. J. Bolt H. W. Hawk (Reprod. Lab.)	1.2	99,000
Improve reproductive efficiency in swine	1106-16140-004 Biochemical and physiological relationships of boar spermatozoa during maturation, freezing, storage, and fertilization	L. A. Johnson (Reprod. Lab.)	1.0	84,044

1106-16140-005 Preserving fertilizing capacity of porcine spermatozoa	V. G. Pursel (Reprod. Lab.)	1.0	84,044
Control of ovulation and synchronization of estrus in swine	H. D. Guthrie (Reprod. Lab.)	1.0	84,044

TABLE 3 e

MEAT ANIMAL AND RELATED RESEARCH CONDUCTED AT BARC IDENTIFIED BY CRIS
AGRICULTURAL ENVIRONMENTAL QUALITY INSTITUTE

Research Activity	CRIS Project	Scientist	SMY	Dollars
Plant Protection - Air Pollutants	1103-14780-002 Action of Air Pollutants on Plants	R. K. Howell (Air Pollution Lab)	0.5	23,700
Insect Control Chemical Formulations	1103-14390-001 Analytical Investigations of Insect Control Chemicals and Formulations	C. Corley (Anal. Chem. Lab)	0.1	4,350
Animal Waste Management	1103-14740-002 Residues in Manure Processed for Live-Stock Feed	C. C. Calvert (Biol. Waste Manag. Lab.)	0.9	66,780
	1103-14740-003 Nutritive Evaluation of Animal Wastes for Livestock Feed	L. W. Smith (Biol. Waste Manag. Lab.)	0.8	58,800
Insects Affecting Man	1103-14411-001 Evaluate Chemicals for Control of Insects Affecting Man	O. F. Bodenstein (Biol. Eval. of Chem. Lab.)	0.1	6,070
Physiology & Reproduction of Insects	1103-12152-001 Insect Chemo-sterilants	A. B. Borkovec (Insect Chemo-sterilant Lab.)	0.1	3,440
	1103-12153-001 Physiology and Reproduction of Insects	M. Schwarz (Insect Chemo-sterilant Lab.)	0.4	13,790

Pesticide Residue - Livestock & Poultry	1103-14281-001 Equipment and Physical Methods for Controlling Livestock Pests	H. J. Retzer (Physical Control Lab.)	0.2	6,720
	1103-14282-001 "White Spot Defect" of Cattle Hides	R. W. Miller (Chem. and Biophys. Control Lab.)	0.1	5,000
	1103-14282-002 Control of Flies with Insect Growth Regulators (IGRs) Added To Cattle and Poultry Rations	R. W. Miller (Chem. and Biophys. Control Lab)	0.2	9,550
	1103-14282-003 Development of Nonchemical Methods of Dairy Cattle Pest Control	L. G. Pickens (Chem. and Biophys. Control Lab.)	0.2	9,500
	1103-14283-002 Pesticide Residues in Tissues and Milk of Dairy Cows	G. F. Fries (Pest. Degrad. Lab.)	0.1	5,600
Protect Animals - Toxic Chemicals	1103-11210-001 Chemical Residues in Milk and Tissues of Farm Animals	G. F. Fries (Pest. Degrad. Lab.)	0.2	16,690
Pests of Livestock & Poultry	1103-15490-001 Physical Means of Fly Control	N. O. Morgan (Anal. Chem. Lab.)	0.2	6,750
Insect Behavior & Attractants	1103-15572-001 Insect Behavior and Attractants	P. E. Sonnet (Org. Chem. Syn. Lab.)	0.2	8,200

Improve Cattle & Swine Production	1103-12010-001	Livestock Farmstead Water Systems	E. E. Jones (Phys. Control Lab.)	0.2	9,500
Hay Equipment - Harvesting - Processing - Storing	1103-15470	Machinery for Establishing and Maintenance of Pasture and Hayland in the East	R. F. Dudley (Phys. Control Lab.)	0.3	14,100

TABLE 3 f

MEAT ANIMAL AND RELATED RESEARCH CONDUCTED AT BARC IDENTIFIED BY CRIS
INSECT IDENTIFICATION AND BENEFICIAL INSECT
INTRODUCTION INSTITUTE

Research Activity	CRIS Project	Scientist	SMY	Dollars
Identification & Classification of Insects of Agr. Importance	1111-12120-005 Identification and Research on Diptera Affecting Cattle, Sheep and Swine	W. W. Wirth	0.3	10,000

TABLE 4a

EXTRAMURAL MEAT ANIMAL AND RELATED RESEARCH CONDUCTED BY BARC SCIENTISTS
NUTRITION INSTITUTE

Laboratory	CRIS No. and Title	BARC	
		Scientist	
Non-Ruminant Nutrition	0701-11312-003A ^a Baby pig nutrition - Georgia	L. T. Frobish	
	0701-11311-002A Whey products of feedstuff for swine - Wisconsin	L. T. Frobish	
	E30-AH-57 Prediction of production performance and carcass quality in swine by biochemical measurements - Yugoslavia.	R. J. Davey	
Nutritional Microbiology	1107-15512-003 N ¹⁵ fixation into rumen microbes - Colorado	L. L. Slyter	
Ruminant Nutrition	E21-ARS-1 Influence of growth rate of bulls on carcass quality - Poland	J. Bond	
	A17-AH-12 Beef Production in Pakistan - Pakistan	D. A. Dinius	
	E30-AH-53 Use of soya and maize in feeding of early weaned lambs - Yugoslavia.	I. L. Lindahl	
	A17-AH-10 Comparison of efficiency of buffaloes and cows in the utilization of various feeds - Pakistan.	P. W. Moe	
	EG-ARS-11 Study of protein production from non-protein nitrogen - Egypt.	R. R. Oltjen	

E21-AH-20	Participation of blood cells in nitrogen recycle in the ruminant and its regulation - Poland	R. R. Oltjen
Y0-ARS-15	Effect of diet on rumen and blood metabolites and the metabolic status of fattening bulls - Yugoslavia.	T. S. Rumsey
0701-13661-001C	Develop and maintain a feed composition data bank for use in the United States - Utah.	P. W. Moe
A7-AH-89	Studies on the combining ability of desirable goat breeds for meat and milk separately and in combination - India	I. L. Lindahl

^a Project number.

TABLE 4 b

EXTRAMURAL MEAT ANIMAL AND RELATED RESEARCH CONDUCTED BY BARC SCIENTISTS
ANIMAL PARASITOLOGY INSTITUTE

Laboratory	CRIS No. and Title	BARC	
		Scientist	
Haemoprotozoan Diseases	1105-11940-003 Bovine anaplasmosis in laboratory animals University of Missouri	T. O. Roby	
	1105-11940-004 Transmission of anaplasmosis between deer and cattle. University of California.	T. O. Roby	
	A7-ADP-37 Chemotherapeutic agents and immunological measures against anaplasmosis. India	T. O. Roby	
	PL-14320-025 Immunity in trichinellosis. Poland	J. S. Andrews R. S. Isentein F. G. Tromba	
Non-Ruminant Helminthic Diseases	PL-14320-058 Influence of intestinal bacteria on immune response in trichinellosis. Poland	J. S. Andrews R. S. Isentein F. G. Tromba	
	1105-14320-002A Trichinellosis in non-garbage fed swine. University of Illinois	R. S. Isenstein	
	PL-11190-009 Immunologic response of sheep to <u>Ostertagia</u> and <u>Chabertia</u> and preparation of a vaccine. Poland	F. G. Tromba	
Ruminant Helminthic Diseases	E30-ADP-27 Vaccination of cattle against cysticercosis Yugoslavia	H. Herlich	

TABLE 4 c

EXTRAMURAL MEAT ANIMAL AND RELATED RESEARCH CONDUCTED BY BARC SCIENTISTS
AGRICULTURAL MARKETING RESEARCH INSTITUTE

Laboratory	CRIS No. and Title	BARC Scientist
Animal Products Marketing Laboratory	0701-13751-001A Develop design standards for poultry processing equipment. University of California, Davis.	J. Goble
	1090-15862-006A Develop improved methods and facilities for slaughtering poultry. University of Maryland, College Park, Md.	C. E. Harris
	1090-15861-002A Develop facility modifications in poultry processing plants to meet noise level standards. University of Md., College Park, Md.	C. E. Harris
Transportation and Packaging Research Laboratory	1090-15863-001C A cost analysis of systems for marketing beef from slaughterhouse to retail food store. 2134 Bel Aire Ave. Duluth, Minn.	Richard W. Lichty C. L. Goulston
	1090-15842-010A Packaging, transport, and storage effects on condition and distribution of fresh beef. Texas A&M Univ., College Station, Texas.	K. Hoke
Meat Science Research Laboratory	1090-15851-008A Predicting lean yields of steers, heifers, and cow carcasses. Texas A&M Univ., College Station, Tex.	H. R. Cross
	1701-13721-003A Rapid analysis of antibiotic residues in meat and organ tissues. VPI, Blacksburg, Va.	A. W. Kotula

1104-15981-001A Reducing salmonellae and fecal contamination of pork, Texas A&M Univ., College Station, Tex.	A. W. Kotula
1090-15811-001A Efficiency of assembling and packaging meat in centralized processing and purveying plants, Univ. of Md., College Park, Md.	T. F. Webb
1104-15981-002 Control of salmonella on retail meat, Univ. of Wyoming	A. W. Kotula
1104-01000-30175 Marketing of fresh and frozen beef, Kansas State Univ., Manhattan, Kansas.	A. W. Kotula
1134-13721-001	
1104-15851-004 Undesirable inclusions intrinsic to animal products, VPI Blacksburg, Va.	A. W. Kotula
PL-ARS-50 Composition, eating quality, Nutritive value and durability to the deteriorative changes of pork in relation to age and sex of pig. Poland	A. W. Kotula
YO-ARS-12 Evolutionary effects on meat quality, Yugoslavia.	K. Ono

EXTRAMURAL MEAT ANIMAL AND RELATED RESEARCH CONDUCTED BY BARC SCIENTISTS
ANIMAL PHYSIOLOGY AND GENETICS INSTITUTE

Laboratory	CRIS No. and Title	BARC	
		Scientist	
Avian Physiology	1106-16112-004A Turkey updated research knowledge system. Clemson University.	H. Opel	
	1106-16112-005A Radioimmunoassay kits for turkey gonadotropins in FY 75. University of Wisconsin.	H. Opel	
Reproduction	0701-11391-001A Immunogenetics of the immunoglobulins of swine in relation to survival and growth. University of Wisconsin.	C. A. Kiddy	
	A7-AH-91 Total synthesis of a "gene" and studies of its biological function. PL 480 India	C. A. Kiddy	
	A7-AH-7 Effects of heat stress on efficiency of milk production in buffaloes. PL 480 Pakistan	H. W. Hawk	
	03-31-083-310Y113 Relation of the function of the liver and some endocrine glands to sterility in cattle. PL 480 Yugoslavia	H. W. Hawk	
	E30-AH-24 Investigation into the neuroendocrine system in reference to reproduction. PL 480 Yugoslavia	H. W. Hawk	
	Relationship between uterine protein secretion and embryonic development in swine. University of Florida.	V. G. Pursel	

0701-11261-001A Endocrine-stress-reproduction
relationships in swine. Michigan State
University

V. G. Pursel

32-014-310-26-059 Polyploidy and early embryonic
mortality in swine. University of Missouri.

V. G. Pursel

TABLE 4 e

EXTRAMURAL MEAT ANIMAL AND RELATED RESEARCH CONDUCTED BY BARC SCIENTISTS
AGRICULTURAL ENVIRONMENTAL QUALITY INSTITUTE

Laboratory	CRIS No. and Title	BARC	
		Scientist	
Pesticide Degradation Laboratory	701-14281-001A Elimination of polychlorinated Biphenyl residues in silos. Wooster, Ohio.	G. F. Fries	
	1090-11211-002A Toxicology and elimination of high level polybrominated biphenyl residues in dairy cows. Michigan State University	G. F. Fries	

Objective 2: Recommendations for Improving Communication Among
BARC Scientists.

The meat animal researcher at BARC is aware that he is walking a tight rope between a desire to improve his rapport with other scientists through seminars, workshops or conferences, and the necessity of addressing his attention to his individual research in order to ensure his effectiveness. He is aware of the desire at many echelons to see him relate to and cooperate with other scientists to minimize segmented research when cooperation would yield a broader approach to problem solving. He is faced with the dilemma of discovering others in related disciplines that might share his interest and concern over a particular research problem. He is certain of his own capabilities and knows he can satisfactorily proceed with a segment of research that will make a limited but significant contribution to the meat animal and related industry and the consumer.

The Committee recognizes the need for minimizing meetings and conferences to prevent some of the frequent interruptions that face the scientists. However meetings that might aid the scientists or deal with an area in which he has an interest are not usually considered an infringement on his precious time. The Committee, therefore, is of the opinion that participation in the recommendations Nos. 1, 2 and 6 be left to the discretion of the scientist.

A seminar series for meat animal researchers was considered but does not appear as one of the recommendations because an effective seminar series is being maintained by several Institutes.

The recommendations of the Committee for fostering awareness of the meat animal research program at BARC follows. The recommendations were not placed in order of priority.

1. Rap Sessions with the Area Director's Office: The meat animal researcher at BARC historically has put forward his best effort in his professional endeavors and, particularly at times of budget cuts and other adversities, has been cooperative and willing to sacrifice in order to maintain an effective research program at the Center. Communication has played an important role in research progress during bleak funding periods because the better informed the scientist the less reluctant he was to increase his dedication to fulfilling the mutual goals. For this reason the Committee recommends that the Area Director or his representative meet with interested meat scientists twice a year for a brown bag informal lunch. By way of introduction, three topics of interest to the scientists would be provided to the Director prior to the lunch so that the session could begin with a discussion of those subjects. Additional time would be spent responding to questions and even listening to complaints. Scientific feelings and needs could then be evaluated directly by the Director. The months of March and October would be appropriate months for such "Rap" sessions.

2. Work Planning Conference: The objective of this type of meeting would be to identify the meat animal research underway at BARC and encourage cooperative effort. To be of benefit to the scientist, such a work planning conference would have to be distinctly different from the program reviews to which he has already been exposed. The

conference would have to be designed specifically for the scientist and not be of the "show and tell" variety. The Committee recommends that the scientists evaluate the advantages of a work planning conference in comparison to the type of meeting suggested in item 6 below. The Committee can provide an appropriate one page ballot for gathering opinions.

3. Livestock Availability: Greater utilization of livestock can be accomplished if meat animal research scientists are made aware of the availability of animals which might be shared with other scientists. It is recognized that acceptance of the livestock would be carried out in a manner to maintain the safety restrictions which may currently be in force. Each Institute should retain the obligation to control animal traffic in its own area.

The Committee has compiled a list of scientists who can serve as contacts for the availability of the various species of animals in use at BARC. The Committee recommends that the list, presented as table 5, be circulated to all scientists who may need animals for research so they can call the contact scientist directly about the availability of surplus animals. The Committee considered presenting an animal inventory listing potentially surplus animals but the list would need to be updated too frequently.

4. Equipment Inventory: Greater use of existing instrumentation might be achieved if meat animal research scientists were aware of the availability of large, expensive instrumentation at BARC. The Committee recommends that the "Major Analytical Instruments Committee" distribute a list of such instruments and contact scientists and their phone numbers to all meat animal and related research scientists. This would provide the possibility of minimizing purchases, cooperating in the purchase of new improved instruments on a joint use basis, and provide an alternate instrument to prevent sample loss due to instrument breakdown.

5. New CRIS Review Procedure: The present CRIS peer review procedure is time consuming and may not enrich the scientific thought processes involved in deciding which avenues of study should be followed. The Committee recommends that all meat animal laboratories conduct a peer review whenever a new CRIS work unit is to be initiated. The principal investigator should carry out a literature review, prepare his protocol for the study, prepare AD 416 and 417 for his CRIS work unit, and notify the Director's Office and appropriate meat animal research laboratories when he will discuss his proposed research. He should allow at least one hour. Discussion over a brown bag lunch would be appropriate. Two scientists should be appointed as peer reviewers by the Director's Office and should receive the CRIS write up one week before the lunch session. The format should be informal so that free interchange can occur. The scientist should mention the state of the art and then describe objectives and procedures. Those in attendance should be able to interrupt with questions and suggestions throughout. After the session the

designated peer reviewers could sign the review form, thus facilitating peer review. This procedure would also encourage suggestions from other scientists on a reciprocal basis. This procedure would not allow CRIS units of less than 0.5 SMY and would not be used for extramural research projects.

6. Position Statements: Scientists are usually most receptive to meetings that may a) provide additional knowledge in their field of interest or b) result in increased support for their research. The Committee recommends that meetings be held once a year, preferably in late January or February to develop a position statement concerning a particular problem area that might require research expertise from more than one laboratory and more than one Institute. The meeting would involve presentations of the state of the art (not necessarily relating to on-going inhouse studies) and then "brain-storming" to develop an integrated approach for attacking the research problem. It is envisioned that the end product of such a conference could be a "package" research proposal that would be forwarded as a request for budget increases. The Committee feels that such a meeting would foster improved communications among scientists and might lead to cooperative research efforts, even if budget increases were not available.

The Committee provides below, four topic areas as examples of problems for which position statements could be formulated. We recognize that topic proposal and selection procedures should involve individual laboratory scientists, chiefs and chairmen of Institutes.

a. The future role of chemicals in agriculture. - In the past 30 years discovery and exploitation of new pesticides, parasiticides, growth promotants and fertilizers has been a significant factor in increasing meat production and decreasing costs. Despite this, concern with potential residue hazards has tended to obscure these advantages. A reexamination of the merits and disadvantages of agricultural chemicals as seen in the context of the research program at BARC is needed.

b. Use of non-competitive feedstuffs for livestock. - Though the price of grain may decline so that it is once again more feasible to use it to feed livestock, we need to be concerned with improving the utilization of forage crops, other cellulosic materials, and the byproducts of horticultural crops which might substitute for grain. This might 1) provide means for disposing of the byproducts, 2) release grain for bolstering our exports, and 3) decrease the criticism which the United States is being subjected to for feeding grain to animals.

c. Interrelationships of stress, meat quality and reproductive efficiency in meat animals. - Recently a bill sponsored by Senator Bellman was passed (involving \$500,000) to investigate losses due to stress, disease and bruises during shipping of beef. Stress during transport is only the visible peak of a much larger iceberg. BARC scientists need to explore the various types of stress, physiological, genetic and environmental, the impact exerted on various aspects of production, on the endocrine system as it relates to growth and reproduction efficiency, and on the quality of meat.

d. Integrated approach to meat animal research at BARC. - The ultimate aim of meat animal research is to develop an animal which produces the best quality meat at the lowest possible cost. Scientists working in disciplines such as genetics, reproduction, physiology, nutrition, meat science and marketing recognize the areas in which knowledge is needed and the priorities of these areas. However, these priority areas should be interlocked across disciplines to achieve the ultimate aim. What approaches can be initiated at BARC so that the integration of disciplines can be achieved?

Table 5. Scientists Who May Have Animals Available
for Other Scientists

Species	Contact Scientist	Extension
Lab. animals	T. E. Amerault (API)	42427
	S. Reiser (NI)	42396
Beef cattle	H. Herlich (API)	42195
	D. A. Dinius (NI)	42284
Dairy cattle	N.W. Hooven, Jr. (APGI)	42243
Swine (Reproduction)	L. A. Johnson (APGI)	42342
" (Genetics)	B. Bereskin (APGI)	42213
" (Nutrition)	L. T. Frobish (NI)	42222
" (Parasitology)	F. G. Tromba (API)	42406
Sheep	R. G. Leek (API)	42509
	I. L. Lindahl (NI)	42284
	H.W. Hawk (APGI)	42550
Poultry	L. T. Frobish (NI)	42222
	D. K. McLoughlin (API)	42300
	N. W. Hooven, Jr. (APGI)	42243
Horses	W. M. Frerichs (API)	42364

*Each Institute shall retain the right to control animal traffic in its own area and shall maintain safety restrictions which may be in force.

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